# TELEREHABILITATION AS MEANS TO IMPROVE ELDERLYS´ INDEPENDENCE WHILE LIVING AT HOME

- Literature review

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Degree Thesis

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| DEGREE THESIS | |
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Abstract:

Living independently at home promotes the well-being of elderly people aged 65 years and above, but there are challenges that they may face such as physical impairment and psycho-social problems. These problems may lead into depression, loneliness and early institutionalization. Therefore some of the elderly people receive or need to receive regular home care and rehabilitation. **Aim**: The aim of this study is to improve clients´ physical and social-wellbeing while living at home and also to address the new model of providing rehabilitation to clients who are unable to travel long distance for health advice or care or may take long time to see health personnel. The research questions used were as follows.

1. What are the significant of telerehabilitation to elderly living at home.
2. What are the challenges of using telerehabilitation.

**Method**: Systematic literature review with content analysis was chosen for analysis. Articles were extracted from Google scholar, Ebsco and Sage which were published from year 2003 to 2012.The theoretical framework used was Empowerment theory. Limitation of this study is that some of useful articles were not in English and also not freely accessible. **Result:** The significant of telerehabilitation was of physical, social, economical, as multidisciplinary improvement and psychological improvement. Challenges are lack of enough staff to conduct the program, personal factors, equipment being hard to use for very elderly people and severity of disabilities. **Conclusion**: Telerehabilitation has shown to improve elderly quality of life and could be an alternative to face to face therapy without neglecting clients need. Further study should be done to solve the challenges rose from this study.



| Keywords: | Telerehabilitation, telecommunication, physical disability, caring tv and elderly people |
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**Tiivistelmä:**

Kotona asuminen edistää yli 65 -vuotiaiden hyvinvointia. Silti asumiseen voi liittyä haasteita, joita ihmisten fyysiset toimintarajoitteet ja psyko-sosiaaliset ongelmat aiheuttavat. Ratkaisemattomina nämä ongelmat voivat johtaa masennukseen, yksinäisyyteen ja varhaiseen laitostumiseen. Riskiryhmään kuuluvien ikääntyvien ihmisten tulee saada säännöllistä kotihoitoa ja kuntoutusta.

**Tavoite**: Tutkimuksen tavoitteena on parantaa kotona asuvien ikääntyvien ihmisten fyysistä ja sosiaalista hyvinvointia. Lisäksi tavoitteena on kohdentaa uusi kuntoutusmuoto asiakkaille, jotka eivät saa terveysneuvontaa tai terveydenhoitoa pitkien etäisyyksien takia ja asiakkaille, jotka tapaavat harvoin terveydenhuollon ammattilaisia. Tutkimuskysymykset ovat

1. Mikä on televisioavusteisen kuntoutuksen merkitys kotona asuville ikääntyville?
2. Mitkä ovat televisioavusteisen kuntoutuksen haasteet?

**Menetelmä**: Menetelmäksi valittiin systemaattinen kirjallisuuskatsaus ja sisältöanalyysi. Käytetyt hakukoneet olivat Google scholar, Ebsco ja Sage, ja artikkelit oli julkaistu vuosina 2003-2012. Käytetty teoreettinen viitekehys oli voimaannuttamisen teoria. Tutkimusta rajoitti englanninkielisen kirjallisuuden puuttuminen ja alan artikkeleiden vapaa saatavuus.

**Tulokset**: Televisioavusteisen kuntoutuksen merkitys oli fyysisessä, sosiaalisessa, taloudellisessa ja monialaisessa kuntoutumisessa sekä psykologisessa kuntoutumisessa. Haasteina ovat riittävä henkilökunnan määrä ohjaamaan toimintaa, henkilökohtaiset tekijät ja helppokäyttöisten laitteiden löytyminen iäkkäille henkilöille, joilla on useita toimintarajoitteita.

**Johtopäätökset**: Televisioavusteisen kuntoutuksen on huomattu parantavan ikääntyvien ihmisten elämänlaatua. Kuntoutus voi olla vaihtoehto kasvokkain tapahtuvalle ohjaukselle ilman vaaraa asiakkaan tarpeiden laiminlyömisestä. Jatkotutkimusta tarvitaan ratkaisemaan tästä tutkimuksesta nousseet kysymykset.



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| Avainsanat: | Televisioavusteinen kuntoutus, tietoliikenne, liikuntavamma, hyvinvointi-TV ja ikääntyvät ihmiset |
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## FOREWORD

I would like to first thank God for protecting me all these years till now and for giving me strength to reach the end of my thesis.

I would secondly like to give my thanks to the Arcada University of Applied Science for giving me an opportunity to study and learn and to be able push me into writing this thesis and for being patient during my study time in Arcada. For providing with direction of what material to use to accomplish my subject as well as planning ahead of time on how to go about in order to finish my studies. My special thanks to Christel Gustav who without her I would not be able to get this topic and to Kustaankartano rehabilitation unit in Helsinki for giving me an introduction of how to use telerehabilitation in practice.

I would like to thank my supervisors Solveig Sundell and Elisabeth Kajander for their support during the whole process of writing my thesis. Despite of being busy they could not hesitate to guide me and give their time to take me to a proper direction.

Lastly I would like to thank my family for being there to supporting me from the beginning of the study to the end. Special thanks I give to my unborn baby who is coming soon, for being patient while mummy is writing her thesis.

# 1 INTRODUCTION

It is believed that, the number of elderly people is increasing as time goes and there-fore we will have one million elderly people in Finland by the year 2020. (Kaij, 2007). Until the end of 2011, population of elderly people above 65 years old was 979,640 people. (Statistical Finland, 2011).

The number of persons aged 65 years or over in Finland is exceeded one million in July 2012. Statistics Finland shows that 1,003,212 persons or over were residing permanently in Finland at the end of July. Women were majority (579,298). Meanwhile back in 1944 the number of people aged 65 and above was a quarter of million and half million figures were exceeded in 1975.Generaly Finland population at the end of July 2012 was up to 5,413,901 (Yle news, 2012). These all figures show that, there is a rapid increase in number of elderly people in Finland and therefore there is a need for services that can help elderly people to live a health life.

Living independently at home promote the wellbeing of elderly people aged 65 and above, and in Finland the national policy is to encourage and enable elderly people to maintain their independence and quality of life and to continue living at home as long as possible. Public health and social care system are responsible to provide these assistances to elderly people. (Ollongvist, 2008)

Among all the elderly people, there were those who needed a regular home care. The percentage has increased. At the end of November 2010, 11.9 percent of over 75 years old clients received regular home care. More than half which is 56.5 percent of clients entered regular home care from home and over quarter 26.7 percentage of clients came from hospital or health care, reasons being either physically(25.3 percent) or neglect of personal care(27.1 percent) . It was determined that 3847 clients (5.6 percent) could manage at home by themselves. (Statistical Finland 2011). There is a high need to improve services due to the fact that there is high demand for regular home care.

Elderly people reported that physical well-being and psychosocial factors such as a sense of purpose in life, being useful to others and to society are important to them.

Physically active elderly people have high level of well-being and socially active. Social inactive results into depression, loneliness and early institutionalization. Social network might have influence physical activities (Eloranta, 2008).

Technology helps people to provide a wide range of possibilities in perception, communication, information processing and mobility and in maintaining health. In order for the technology to be effective, it should be easy to use, useful and available at a reasonable cost. Technology when used effectively can help in preventing age- related diseases and age-associated losses strength, endurance and other physical abilities. These losses can be modified by the interventions such as improved nutrition, physical exercises, healthier environment and modification of the life style. (Harrington, 2000)

Gerontechnology can also help in performance and give opportunity to the elderly in to a new role that fits them. Example of the new role can be modification in social situation, change of work and leisure situation. Communication can be one of the roles in social situation in which the technology will help elderly person to communicate with other people for education purpose or to make contact with the society. (Harrington, 2000)

Telerehabilitation or Caring TV is one of gerontechnology device which has being used as a means to enhance physical exercises and social interaction while the client is at home and the health personnel is at the office. This device was designed for elderly people who are living at home and who are unable to go outside for walks or to participate in the community. It is also designed for clients who have returned home from rehabilitation and are in need of long term rehabilitation but due to long distance, movement difficulties and cost for travelling are unable to attend to rehabilitation. (Lehto, 2011, Hill, 2010)

As it a means to provide rehabilitation in a form of exercises, a client will be able to see the physiotherapist on the screen TV instructing on how to perform a required task and therefore a client can repeat the task until the desired performance. (Brennan, 2008)

## 1.1 Motivation for choice of research topic

The author got the motivation from the two courses that were attended the first one was activities with the elderly people living in community where the author had to visit an elderly client and activation was the goal. The client wanted to stay at home but had some limitation which resulted to agree on living with her friend in the house to get help with toileting and cooking food. The client was also unable to go out for walks due to the slippery weather of winter. Therefore there was little contact with the community except for her friend.

The other course was gerontechnology whereby the author had to find a device which can help an elderly client or assist. Due to the fact that the author was interested in rehabilitation, the device was chosen for the purpose of rehabilitation. The assistance in finding the device was required and was found in Kustaankartano with the help of the lecturer Christel Gustav from Arcada University of Applied Science.

## 1.2 Aim of the study

The aim of the study is to improve clients´ physical and social well-being at home
This study will help in general to address a new model of providing rehabilitation to clients who are unable to travel long distance in looking for health advice or care that may also take long time to see health personnel.

The questions formulated in order to reach the aims are as follows:

1. What are the significance of telerehabilitation to elderly people living at home.
2. What are the challenges of using telerehabilitation.

## 1.3 Definitions

Telerehabilitation is the delivery of rehabilitation services via telemedicine methods and techniques. It can also be defined as delivery of medical rehabilitation services and support of independent living, using technology.

Telemedicine is the transfer or exchange of medical and healthcare information using information and communication technology.

Gerontechnology is the study of technology and aging for ensuring good health, full social participation and independent living throughout the entire life span.

Health promotion is defined according to WHO as the process of enabling people to increase control over, and improve, their health from an individual to the social and environmental interventions.

Rehabilitation is the process of helping an individual achieves the highest level of independence and quality of life possible - physically, emotionally, socially, and spiritually.

# 2 THEORETICAL FRAMEWORK

The theory that was chosen for this thesis is Empowerment theory tries to explain the link between individual strengths and what they can do, also explains natural helping systems and proactive behaviors which gives the result to social policy and social change. It links individual well-being with the larger social and political environment. Empowerment helps to create a responsive community by thinking in terms of strength versus weaknesses, wellness versus illness and competence versus deficit. Empowerment oriented interventions does not only improve wellness but also provide opportunity for participants to increase knowledge and skills and use professionals as collaborators instead of authority experts. The theory include both process and outcomes which explain that actions, activities or structures which are the processes may be empowering and the level of empowerment results from the outcome coming from the processes (Perkins 1995). This means an individual or a community should have power to decide whether they want or are willingly to engage in an activity. The willingness will have positive results to the target person even if the result is not physical.

By definition theory of empowerment is "an international ongoing process centered in the local community, involving mutual respect, critical reflection, caring and group participation, through which people lacking an equal share of valued resources gain greater access to and control over those resources". (Perkins 1995). Empowerment has been described Bernard, 2000: 28 ´As an ideal or ethos, as a goal, as a skill as a process or set of process and as an outcome or outcomes'. Empowerment has been a central to the development of the discipline of community psychology and key element of social work activity. (Bernard, 2000:29)

Bernard, (2000: 32) has summarized the theory of empowerment and called them principal. The following are the principal of empowerment;

- Empowerment should enable personal development as well as increasing influence over services
- Empowerment should involve increasing people`s ability to take control of their lives as a whole, not just increase their influence over services.
- Empowerment of one person should not result in the exploitation of others either family members or paid carers.

- Empowerment should not be viewed as zero sum meaning a partnership model should provide benefit to both parties
- Empowerment should be reinforced at all levels within service systems
- Empowerment of those who use services does not remove the responsibilities of those who produce them.
- Empowerment is not an alternative to adequate resourcing of services.
- Empowerment should be a collective as well as an individual process, without this people will become increasingly assertive in competition with each other.

The whole process of empowerment theory is to promote health to one individual and community as whole. As an individual, one gain sense of power by participation in an activity that will provide knowledge and improve physical capacity. Telerehabilitation is a good means to create empowerment as firstly the individual or groups are able to choose to take the responsibility and do rehabilitation in their own home which makes them to have power in their own environment.

# 3 BACKGROUND INFORMATION

This chapter will explain what is already known about Telerehabilitation in elderly people living at home. The researcher will explore different concepts including the origin of telerehabilitation, and importance of telerehabilitation to elderly people.

## 3.1 Origin of Telerehabilitation

The motivation for telerehabilitation has been a desire to improve the delivery of rehabilitation services, enhance the continuum of care and promote client involvement and participation in treatment at separate location from the client and health personnel to overcome the obstacles of distance and lack of access to trained providers. Together they contribute to the long-term dynamic process of rehabilitation and related to functional outcomes and level of recovery a client can achieve.

Brennan and Mawson, (2009). Described that some of the first telerehabilitation projects, clinicians used the telephone to provide client follow- up and caregiver support, and to administer client self-assessment measures. Later in 1980´s the approach expanded to include the use of closed circuit television and prerecorded video material to provide visual interaction with client. Again the technology expanded to the use of interactive videoconferencing with an emphasis on rehabilitation intervention relied on audio-visual interaction and which lack physical contact. Despite lower quality video transmission at that time, telerehabilitation was shown to be feasible method for delivering a range of rehabilitation treatment and assessment intervention.

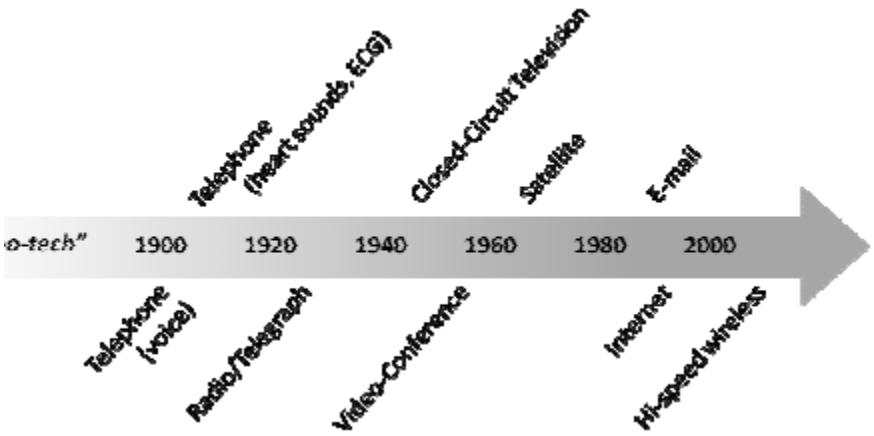


*Figure 1: Origin of Telerehabilitation. Timeline of information and communication technology (ICT) utilization (Brennan, 2009)*

## 3.2 Human factors for designing telerehabilitation

For the technology to be successful and move forward, it must be focused on the users from the point of planning, developing and implementation of the telerehabilitation. Uses are clients, clinicians, support staff, caregivers and administrators. The system of technology should be user- friendly and have less error-prone (high level of fault tolerance). (Brennan, 2009)

When considering the users, one has to look beyond age, education and technology experiences and account for possible impairment in cognitive, gross and fine motor function and visual and language skills.( Brennan, 2009)

Another factor is accessibility of treatment space, training materials, consent documentation. Some clients for example uses wheelchair and therefore during the rehabilitation, space is needed for one to be comfortable. (Brennan, 2009)

Telerehabilitation should maximize a patient's ability while minimize the effect of any ability that may have been lost or impaired. This is accomplished by applying basic universal design principles for example, providing a large button telephone, offering alternative input methods to devices such as touch-screen or voice recognition or using sim-

plified large text or graphic based instruction manuals and troubleshooting guides. (Brennan, 2008)

The technology should account for the clinician users who are involved in all aspects of service delivery in the scope of technical knowledge experience and training matters. Therefore in delivering of telerehabilitation, clinicians should ensure that the service they intend to provide is within their professional scope of practice and that they possess the knowledge and skills required providing them. ( Brennan, 2008)

When training clinicians and supporting staff, attention must be paid to ensure everyone is familiar with disability related matters and is comfortable about communicating with patients who may have impaired speech or language. For clients, simple demonstration during education should be introduced rather than course- based instruction in order for the technology to be fully understood. (Brennan, 2008)

Moreover, according to Brennan (2008) explained that there is no single generic system that meets the needs of all applications, rather system needs to be flexible based on their entire context of use.

## 3.3 The technology

Zhang and Hu et al, (2006) Have described telerehabilitation of upper limb motor rehabilitation. The technology consists of three components, motion tracking system, 3D animation and telecommunication.

Hill (2010) has reported from the outcome of the research that, there was better clinical outcome of telerehabilitation of the upper extremity function measures, range of motion and pain intensity measures, quality of life scores and functional status for patients with a spinal cord injury, voice function and attainment of patient goals.

*Figure 2: the simple telerehabilitation (caring tv) set up*

*Raij, K and Lehto, P*

*http://www.caringtv.fi/professionals/history.html*

### 3.3.1 Motion tracking system

This is on the side of client in use in which it comprises of the client and therapist or health personnel. Motion tracking system is designed to reduce cost. The system is called `peer to peer' (P2P) which does not need server and which allows video and audio streams to be used by a large group of users. It also has Internet protocol (IP) multicast in which together with P2P helps to reduce traffic when used in groups during videoconferencing. (Zhang and Hu et al, 2006)

### 3.3.2 3D animation

This is experienced when a therapist is observing a client not in real time.3D animation will allow the therapist to observe the clients movement in different angles after the session for comparison with the historical case studies of normal and abnormal motions.

### 3.3.3 Telecommunication

Video and audio data are captured and transmitted using a Java media framework (JMF) and real time transport protocol (RTP), in which JMF is a powerful toolkit for processing video and audio while RTP is the internet standard for transporting real time data such as audio and video.

Lehto and leskelä (2011) Described the technology in a simpler way and used the name Caring TV. The technology is based on videoconference. The system consists of software and hardware. The basic setup of the technology includes a computer, a monitor, a camera and a speaker microphone or an earphone- microphone headset. The client can ask for more peripheral equipment like bracelets which when used during rehabilitation provide guidance for the right movement.
Caring TV broadband center is design to transmit program to the client, in which it comprises of the processor, a big screen TV with high definition television, videoconferencing microphone and remote controlled camera which can be turned and zoomed.
The researchers explained that the client´s touch screen has buttons which the client can use to connect direct to the caring TV program also to assess to telephone directory. The screen view can be customized according to client´s need for example if unable to read, the symbols can be introduced into the screen.

## 3.4 Elderly with telerehabilitation

Ollonqvist (2007) explained that frailty is often a cause of disability which leads to dependency and increase use of public services. Frail elderly people are considered a group for program aim at preventing or delaying disability. Elderly rehabilitation has shown to increase or restore elderly functional ability and prevent early institutionalization.
From the research done by Hill (2010) explained that, telerehabilitation has focused principally on developing valid and reliable remote assessment protocols within the disciplines of occupational therapy, physiotherapy, and speech and language therapy.
Daniels et al (2011) identified the risk factor for developing disability in community dwelling elderly people as cognitive impairment, depression, comorbidity, increased or

decreased body mass index, lower extremity functional limitation, fall, low frequency of social contact and low level of physical activity.

Telerehabilitation was developed due to number of challenges that were faced by elderly people with disability. According to Hill (2010), the issue of mobility was one of the challenges that faced elderly people who were in need of rehabilitation. Due to difficult in mobility the client can have difficult in accessing services. Telerehabilitation has been shown to reduce the problem of immobilization to a long distance care center for rehabilitation. A client could acquire the same rehabilitation service when at home by the use of telerehabilitation.

The researcher continued to explain that the technology helps to reduce cost of travelling due to no distance at all to follow the service.

Another challenge which is faced by elderly people is growing number elderly people and therefore less service providers. In addition to that there has been a trend toward shortened lengths of stay in rehabilitation facilities as a mean to contain costs. The result is early discharges which will results to problem of accessing services. Therefore telerehabilitation provides means by which client can still receive rehabilitation services after being discharged from the facility (Hill, 2010).

Social interaction is one of the challenges that are faced by elderly people living in the community. Most elderly people who have difficulties in movements or walking outside tend to stay indoors and therefore feel useless and have no sense of belonging. Telerehabilitation has been introduced with the aim of activating elderly people into social life. This is accomplished by having a group discussion within a telerehabilitation session or having social interaction with another client outside the session time. Telerehabilitation which includes physical exercises will help the client with the movement difficulties and hence enable the client to move outside the house. (Lehto, 2011)

# 4 RESEARCH METHODOLOGY

In this chapter the writer will explain the research methods used. According to Bowling (2006), research method refers to the practice and techniques used to collect, process and analyze data. The study is qualitative and the method used by the writer is content analysis. Literature review is used to get information for background on the topic chosen.

## 4.1 Systematic literature review

This is a method of data collection in which the researcher searches the existing books, articles and other sources to develop framework to the research problem. Here is where the literature review helps to compare the findings of the researcher with the existing findings in order to broaden the knowledge on the research area and therefore to support or contradict earlier research. Literature review helps to establish the theoretical roots of the study clarify the idea and develop research methodology. (Kumar, 2011)

The writer has reviewed 10 articles which are scientifically written in order to answer to the questions asked in this paper. The reviewed articles will be used to in the results which will then draw the conclusion.

## 4.2 Data collection

In this study, the writer used the secondary sources in literature review to gain information on telerehabilitation and what are the significant of using telerehabilitation in elderly living in their own homes. Secondary sources mean that the data are collected from other studies that have been done previously.

The articles were extracted from Google scholar, SAGE and Ebsco and they were scientific papers which must have abstract. The articles selected where the ones that had the

subject effects or significant of telerehabilitation to elderly living at home who are undergoing rehabilitation due to disabilities in old age.

The articles chosen were the one that were published from the year 2003-2012.

The search words that were used during collection of data were such as telerehabilitation, telecommunication, physical disability, caring TV and elderly people. The words like telerehabilitation, caring TV could be used without additional words but other key words could be used with the words and separated by ´AND´ in order to get the required information. For example telecommunication was combined with elderly people and ´rehabilitation´ was added to get the required articles. Table 1 shows the searching criteria and how it was done to acquire articles.

*Table 1: Data Search process*

| **Data base search** | **keywords** | **hits** | **Articles reviewed** | **Articles used** |
|---|---|---|---|---|
| Ebsco | Telerehabilitation with elderly people | 50 | 12 | 2 |
| Google scholar | Telerehabilitation | 4,070 | 40 | 5 |
| SAGE | Caring Tv | 173,000 | - | 1 |
| Google scholar | Telecommunication and elderly people and rehabilitation | 103,000 | - | 2 |

### 4.2.1 Including and excluding criteria

The criteria used to collect the articles and previous researches are that they should have abstract which is scientifically written, fully texted, free of charge and published from 2000 to this date. Table 2 shows how the inclusion and exclusion of article and researches was done.

*Table 2: Inclusive and exclusive criteria*

| **Inclusive criteria** | **Exclusive criteria** |
|---|---|
| • Articles with abstract<br>• Articles or researches published from 2000 to 2012<br>• Free access articles<br>• Written in English<br>• Full articles<br>• Articles that answers the questions | • Articles which are not scientifically written.<br>• Older than 2000<br>• Written in other language than English<br>• Not in full text<br>• That do not relate to the topic of telerehabilitation<br>• Not freely accessible. |

## 4.3 Content analysis

Content analysis is the process of analyzing written documents which can be either journals, articles, researches, books, interviews or observational field notes in order to identify the main themes of the researcher. (Kumar, 2011).

The procedures in content analysis are that the data collected are coded by themes or category and then they are analyzed and presented. The analysis is made by searching the whole data set for the category and make comparison between each. (Bowling, 2006)

The author will answer questions by using themes, categories and sub categories by analyzing the content.

## 4.4 Validity and reliability

Validity is referred to as the appropriateness, quality and accuracy of the procedures adopted for finding answers to the research questions. It can also be defined as the degree to which the researcher has measured what he has set out to measure. (Kumar, 2011). The objective or aim of this study is to support elderly people physically and socially in their homes and the questions are significant of telerehabilitation and how can they use this technology in order to achieve the aim. In answering the questions the author believes that the study will find its aim. Also the study is valid due to scientific use of the articles to answer the questions.

Reliability is referred to as the consistency and stability of an instrument which then becomes predictable and accurate. The test is set to be reliable if the repeated measurements give the same results (Kumar, 2011). By the use of reliable sources which includes the articles and previous researches done the reliability of the articles collected was shown and therefore the result will also be reliable.

## 4.5 Ethical consideration

From the Arcada guideline for writing thesis is that, firstly the school has to accept the thesis that is being prepared. Therefore the author had to prepare a short plan for the thesis and being presented to the supervisor and later being signed and forwarded to Arcada ethical committee for approval. The Arcada commissioned the thesis and therefore it is to be presented in Arcada.

In addition to that, the author read and understood ethical considerations made by Arcada ethical committee. The guideline for writing thesis was followed throughout the thesis writing.

# 5 RESULTS

In this chapter the author will answer questions by analyzing articles chosen to answer these questions. The results will be divided into main theme, category and then to subcategory by showing the figure and also explain each category and subcategory according to the articles found.

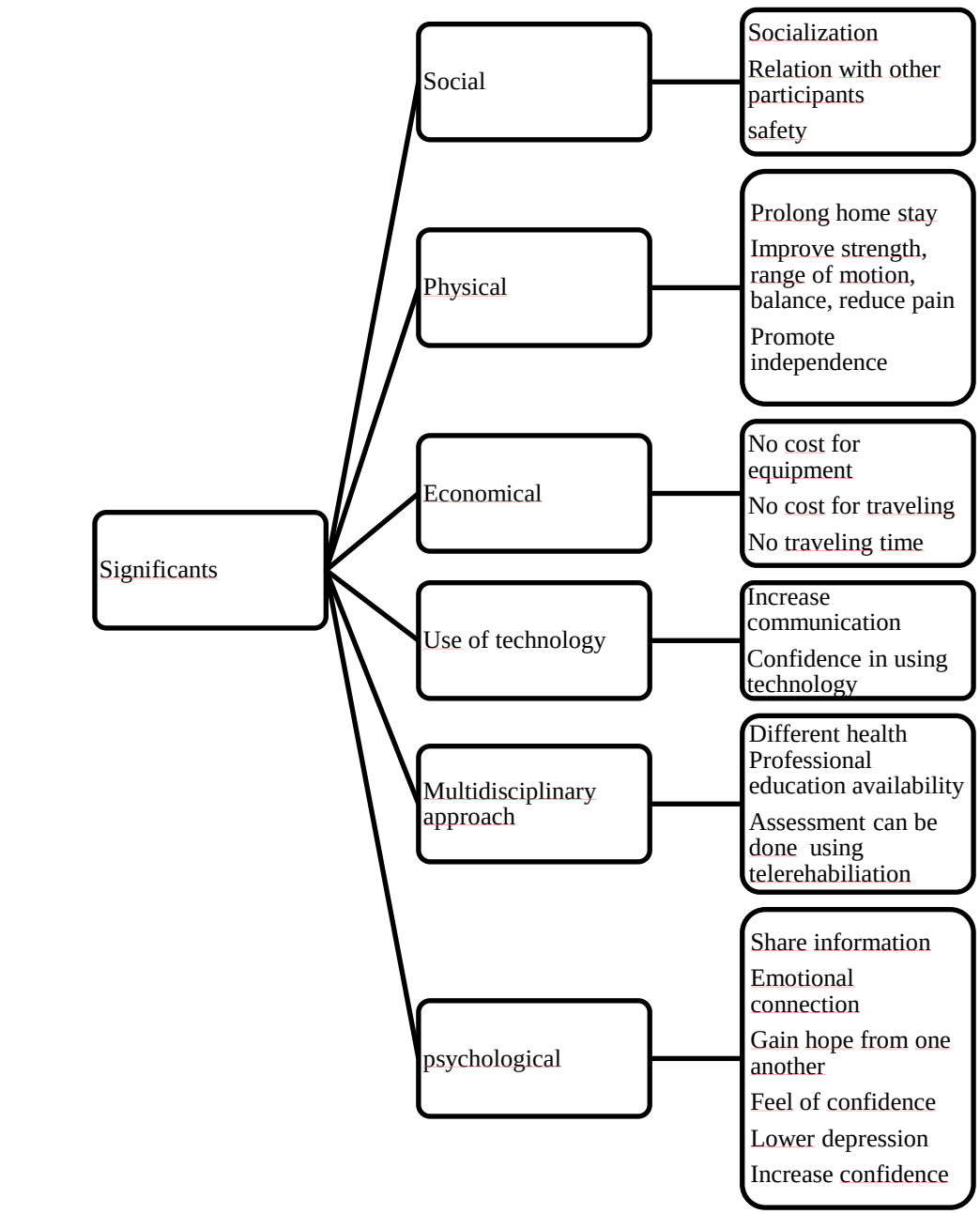


*Figure 3: summary of significant of using telerehabilitation*

## 5.1 Significant of Telerehabilitation to elderly people living at home (Question 1)

### 5.1.1 Social improvement

Social interaction is one of the problems faced by elderly people living at home who have disability and are unable to go out of the homes in the community. Taylor D, 2012, reported that there were good communication between the therapist and clients and clients themselves despite the demographic differences. This social interaction enabled the clients to be willingly to participate in the program. Taylor still explained that some clients felt like they were in the same room with other clients and it felt good. This shows how telerehabilitation can provide relationship between participants and the therapist. (Hoenig, 2006, Taylor, 2012)

Social involvement was also seen when clients were having a group therapy, as telerehabilitation gives an opportunity for the clients to meet using a videoconference while executing their tasks. They were also able to know each other and share information with each others during the session and out of the session and therefore the start of friendship. (Taylor, 2012, Sveistrup, 2013, Finkelstein, 2008)

### 5.1.2 Physical improvement

Most of elderly people have physical problems which prevent them from performing daily activities while at home. As a mean to provide intervention, telerehabilitation has the strategy of providing functional intervention to the aging population. The positive outcome in improvement of physical function has been observed by Bernard et al, 2009. The telerehabilitation program involved both upper and lower limbs, but only the upper body motion was assessed because of limited human resources. Range of motion was assessed of right and left arm flexion, right and left arm abduction and for strength and repetitions were made. The results show that using telerehabilitation a client can do same exercises and improve on both range of motion and strength in the upper limbs. In performing these exercises may improve functional limitations and therefore avoiding

institutionalization and promote independence at home. (Bernard, 2009, Holden, 2007, Finkelstein, 2008, Glinkowski, 2010, Tousignant, 2009)

Balance is one of the factors that result from physical impairment which may result in to fall. Some of the conditions that can lead to imbalance are stroke, which is presented by weakness of one side upper and lower limb, difficult in communication (aphasia) which may be present to some and not to other, vestibular problems which makes someone to feel dizziness when standing. With exercise by using telerehabilitation the client was able walk with the more speed higher than before and could gain some balance while walking and therefore more confidence was experienced. (Deutsch, 2012, Finkelstein, 2008)

### 5.1.3 Economy improvement

Most of elderly people who have disabilities have difficulties to move around including going to their weekly therapy, moreover they may experience difficulties in using public transport or unable to pay for the private transport due to financially problems. Telerehabilitation is designed in a way that a client can receive rehabilitation while at home and the therapist is able to provide the rehabilitation while at center. The travelling cost is eliminated in that case and therefore even other advantages like feeling tired during the travel time will be avoided. Traveling time was also avoided in this case as now the client would not think of planning about when to get out of the house and worry of being late for the rehabilitation. (Peel, 2011, Holden, 2007, Taylor, 2012, Deutsch, 2012)

As there is no travelling time and cost the client is able to perform exercises for a long duration of time hence make the therapy more effective (Peel, 2011)

Telerehabilitation may also benefit clients by having frequency in therapy appointments. Elderly people who are discharged from rehabilitation still need to attend to therapy as many times as possible, but because of less professionals in the clinical field a client has to wait for a long time to get the appointment date. Telerehabilitation was able

to decrease the waiting time and therefore providing the service on time as much as the client's needs after the assessment. (Hoenig, 2006)

Another economic significant is that there was no cost for the equipment as most of clients possess computer only some clients had to be given camera by the therapists. (Deutsch, 2012)

### 5.1.4 Technology/ Equipment

Telerehabilitation equipment is equipment that is designed to be of user friendly which means easy to use and therefore is expected that most of vulnerable group of people like elderly will be able to use the equipment without help even if they do not have much experience with the computer (Deutsch, 2012, Bernard, 2009, Finkelstein, 2008). By the use of telerehabilitation clients could learn a way to perform task in a right way and also gain a way to perform a task and this helped then in performing activities of daily living. (Hoenig, 2006)

The technology is a way of communication and therefore is advantageous for elderly people who cannot go out to be able to communicate with other people in the community. (Finkelstein, 2008)

### 5.1.5 Multidisciplinary approach improvement

Most elderly people can benefit well with telerehabilitation when receiving multidisciplinary advice. Education can be one of the reasons to gain from multidisciplinary; example is an education on how to execute a task such as of fine motor given by occupational therapist or gross motor given by physiotherapist. These tasks will help to improve functional capacity and quality of life. (Hoenig, 2006, Glinkowski, 2010, Peel, 2011)

Assessment could be done by the therapist in order to plan a new intervention by using telerehabilitation and therefore many professionals could be able to assess the clients at

distance and therefore becoming an advantage to the client to receive multiple services in a short time. (Hoenig, 2006)

### 5.1.6 Psychological improvement

Psychological problems like depression and lack of confidence is experienced in elderly people with disability who lives in their own homes. Using telerehabilitation has shown to improve depression as during performing of activities such as exercises in groups, one can compare with the others and do a better maneuver and therefore praise one another or correct each other. (Finkelstein, 2008)

As telerehabilitation allows contact between clients, there may be a start of emotional connection which leads to friendships. Gaining hope when one needs can be given to clients from the therapist and mostly at any time since the therapist may not need to be in the same room with the client. Telerehabilitation may provide a means for sharing information between clients and also to the therapist or assigned nurse. (Taylor, 2012)


*Figure 4: Participants in group telerehabilitation (caring tv)*

*www.turvallinenkotihanke.fi*

## 5.2 Challenges of using telerehabilitation (Question 2)

The author will categorize the challenges of using telerehabilitation by category and subcategory with the figure and explain each category given to gain an understanding to the reader.

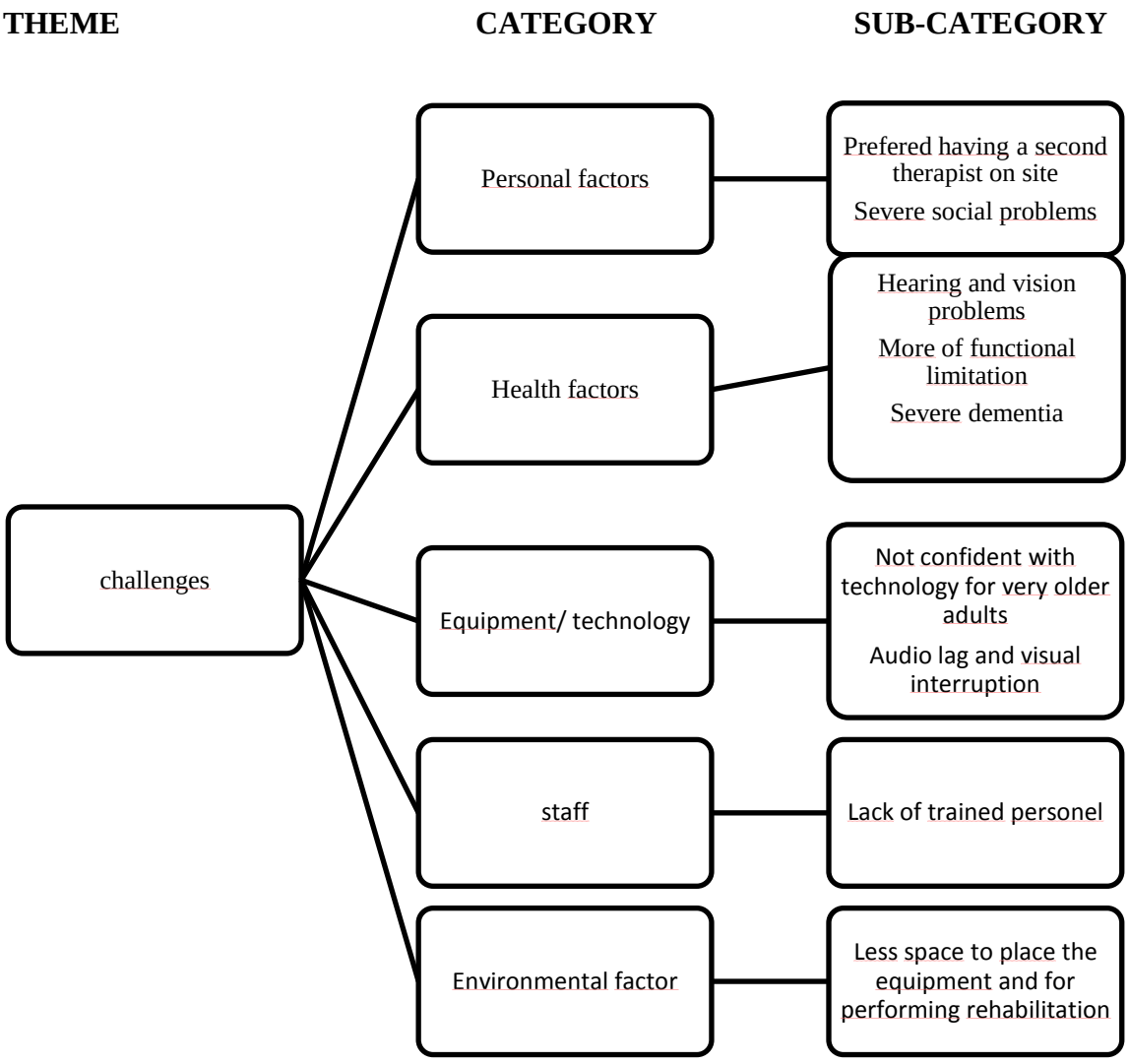


*Figure 5: Challenges on using telerehabilitation*

### 5.2.1 Health factor

Telerehabilitation was designed with favor of user in mind, but not all the users can be able to use the equipment designed with fully capacity. Therefore there are some challenges that a user may face when trying to use the service. Researchers have found that telerehabilitation cannot be used by the clients, who have severe in functional limitation, as telerehabilitation is designed for elderly who are able to perform exercise without a help of the therapist on site or with very little help on site. (Bernard, 2009)

Telerehabilitation is also designed for clients to be able to see and hear the therapist performing a task and then follow what the therapist is doing. The researcher has found that clients who have severe sight and hearing impairment may not benefit from using the technology. The motivation to work on an activity on what you see and hear and therefore most of the clients who have severe hearing and vision impairment were excluded in the studies conducted on telerehabilitation. (Peel, 2011)

Dementia is another factor for exclusion in the study of telerehabilitation. Very severe dementia elderly people were excluded in the studies as they expect a person to remember how to use the computer after being taught because the therapist may not be there in the house to teach them how to open the computer although the device is expected to be simple to use. (Peel, 2011 )

### 5.2.2 Personal factor

Some of the clients preferred having a second therapist on site meaning one is shown the screen and the other is at home with the client. This may be because they have difficulties following the instruction or in need of more assistance at home when exercising or on opening the computer. This can also show lack of confident but still willingness to perform exercises (Deutsch, 2012). Social problems also made telerehabilitation impossible as some of the elderly people are not confident enough to be around other people when performing exercise or on discussion, some of elderly people suggested a face to face as talking to the television feels funny.( Taylor, 2012)

### 5.2.3 Equipment

There is a challenge with very old people of over 80 years of age with the technologies. Most of them are still not confident or have no education using the computer and therefore proving a means of rehabilitation using the computer may not be successful as planned. Therefore this may present as a barrier for performing rehabilitation to the very older adults. (Bernard, 2009, Peel, 2011, Glinkowski, 2010)

Telerehabilitation is designed in a way that when someone is talking the picture of the person becomes bigger and visible than of other participants and the sound becomes bigger. Therefore when suddenly two people or more are talking at the same time the visual and audio becomes interrupted. This becomes barrier because some of the clients would not participate in communication in fear of interrupting others. (Taylor, 20011, Deutsch, 2012)

### 5.2.4 Staff

Another challenge with the use of telerehabilitation is that there is lack of trained staff on how to use telerehabilitation. It is not expected to have the same therapist to talk to the client for the whole period of rehabilitation and therefore there should be enough trained staff in case of unavailability of the other usual therapist. (Peel, 2011:365)

### 5.2.5 Environmental

In order to participate in the program a therapist has to assess a client home for the availability of the space to place the device and enough space which is wide enough to conduct the rehabilitation. Lack of enough space may lead to inability to perform task in a safe place and hence not feeling safe even in their own surroundings. This can result into a client not to get even a chance to be included into the program that will benefit them. (Peel, 2011:365)

Table 3: *summary of interview findings (Taylor, 2012)*

| Category | Factors enabling participation | Perceived barriers to participation | Overall satisfaction | Suggested improvements/ strategies |
|---|---|---|---|---|
| Accessibility and distance | • accessibility without traveling long distances | – | • appreciation of opportunity to participate | – |
| Impact of VC on participation in discussion | • video - as well as audio connection<br>• open microphone, continuous presence connection<br>• site coordinators<br>• feeling as if already met in person<br>• feeling of being in the same room with everyone<br>• easier to talk across VC | • audio lag<br>• visual limitations: chosen camera focus, decreased facial details & expressions, limited ability to transmit feelings and emotions, 'distance feeling'<br>• local side conversations limited feeling of being in same room<br>• more difficult to talk over VC<br>• concern about confidentiality with volunteers | • positive experience<br>• Experience different from face-to-face experience<br>• would have preferred delivered locally face-to-face but understood not available | • use of preset close-ups of each participant so that focus is on speaker<br>• ability to control camera at all sites from host site<br>• better orientation/ set-up of VC equipment during first few sessions<br>• larger viewing screens<br>• more than one participant at each site<br>• facilitators more explicitly invite participants to talk |
| Impact of VC on exercise participation | • camaraderie benefits of exercising with a group<br>• felt safe | • difficult discerning exercise difficulty by facilitator<br>• limited exercise facilities for walking | • appreciated supervision | • use of volunteers at local sites |
| Impact of VC on group experience | • met needs for information and support<br>• group benefits achieved, ie empathy, motivation, altruism<br>• felt group connection regardless of age and geographical differences | • videoconference limited perception of group connection<br>• difficulty getting to know other caregivers as well without in-person connection<br>• difficult being a single participant at a remote site | • positive group experience | • encourage more than one participant at each site<br>• one face-to-face meeting toward the beginning and possibly at the end<br>• facilitators do face-to-face assessment |

VC: Videoconference

VC: Videoconference

## 5.3 Application of theory to practice

As the theory chosen for this thesis is empowerment theory which looks into a process form making of the goal, skills, process to an outcome.

The whole process of empowerment theory is to promote health to one individual and community as whole. As an individual, one gain sense of empowerment by willingly participates in an activity that will provide knowledge and improve what a client has set a goal to achieve. Telerehabilitation is a good means to create empowerment as firstly the individual or groups are able to choose to take the responsibility and do rehabilitation in their own home which makes them to have power in their own environment. In terms of skills is to accept to be taught how to use telerehabilitation to promote their heath is another step toward empowerment. The whole process of executing the exercise given or participation in the group discussion is another step. Lastly the outcome of all this process for example social improvement, physical improvement and economic improvement shows that empowerment is the continuing process and also is an opportunity to optimizing the ability of individual and the community as whole.

# 6 DISCUSSION

The population of elderly people increases as the time goes. As reported by Yle news, 2012 at the end of July, the number of elderly people aged 65 years and above exceeded one million. This means more of health care services have to be improved and increased. The Finnish government encourages elderly people to continue living at home but there are many challenges that elderly people with disability face at home in terms of care, functional capacity and psychosocial factors.

The aim of this study is to improve client`s physical and social wellbeing while at home also to address the new model of providing rehabilitation to clients who are unable to travel long distance for health advice or care or may take long time to see health personnel

The research questions addressed here were as follows; 1. What are the significant of telerehabilitation to elderly people living at home. 2. What are the challenges of using telerehabilitation.

The theory chosen for this study is Empowerment theory by Perkins in 1995 and Bernard in 2000 which is explained as one model for health promotion. Empowerment is explained as an ongoing process which involve critical reflection, caring and group participation in which there is a gain access to and control over the resources. Empowerment involves an individual, organization and community.

The results of this study show that there are significant of using telerehabilitation. Social improvement is one of the significant in which when an elderly involve in the program of telerehabilitation will benefit from social interaction with other participants.

Physical improvement such as strength, increase range of motion and improved balance were observed to be improved after telerehabilitation, therefore gaining of confidence and feeling of safety will be achieved.

Financial improvement such as no travelling cost, no travelling time and no cost of equipment for the purpose of rehabilitation was eliminated as now the rehabilitation could be done at home.

The equipment was easy to use as it is a user friendly device and it can also be used to communicate with other people who are out of reach for example family and friends and health care professionals.

Telerehabilitation provide the means for multidisciplinary approach. To be able to communicate with different professionals for education or assessment purposes is a good opportunity for elderly as a step to good quality of life.

The last significant of telerehabilitation is psychological improvement in which having contact with other clients helps to gain support and therefore reduce depression.

Every intervention has challenges when is being introduced, there were few challenges of telerehabilitation that were observed during the analysis of the articles. Most of these challenges were used as exclusion criteria for not being able to use telerehabilitation. On the side of the clients was that it was very difficult to use telerehabilitation to clients who had severe functional limitation, severe hearing and vision impairment and for clients with severe dementia. Some clients preferred having a second therapist on site because the need assistance during opening of the computer or when performing exercises. This could be due to lack of confidence.

Some clients complained that the equipment had problems with visual and sound interruption, also some of the very elderly people had difficulties using computer in general.

The other challenge was that there were very few stuff who were taught to use telerehabilitation technology and therefore it was necessary to terminate the program of the day due to lack of stuff to run it.
Lack of space in the house to place the computer was also a challenge, small space to be used for rehabilitation purposes was also challenge in which was grouped as an environmental factor.

# 7 CRITICAL ANALYSIS

The whole process of researching article for analysis was very challenging to the author as it was not easy to find articles which were according to the aim set. Most of the articles were excluded due to the different methods of using telerehabilitation like using a mobile camera to check an elderly person going to toilet which was found to be inappropriate but maybe useful to other studies but not the current study.

Some of the good articles were written in other languages like Finnish, could not be used as the author had little knowledge about the language and therefore there could be misunderstanding with analyzing the articles.

Other articles needed to be paid so as to use them. This was a barrier to the author and therefore many articles were left out of this study.

The strength in this study is that almost all the articles had the same results about significant of using telerehabilitation to elderly people living at home. They also had same few challenges of telerehabilitation.

# 8 CONCLUSION

Telerehabilitation can therefore be called one of the health promotion strategies which was introduced with elderly people in mind but also elderly who have disabilities and have limitation in their daily activities. Telerehabilitation has been found to be beneficial to elderly people who live in their homes who have difficulties going out of their home or who face difficulties performing functional activities, with little or no social interaction.

Telerehabilitation could also be used instead of home rehabilitation in which a therapist visits an elderly person who lives at home for the purpose of providing rehabilitation. Most of the articles reported that telerehabilitation can produce the same effect as the conventional rehabilitation which is the usual rehabilitation and therefore it is beneficial for both the client and the therapist to use telerehabilitation but also it is recommended to still visit an elderly person at least once a month or when necessary face to face.

More studies should be done find a way to manage these challenges that rose during the studies. If possible Arcada should start the telerehabilitation department with the aim of solving the challenges in practical means.

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## APPENDICES

*Table 4: List of articles used in the review*

| Author(s), place and year of publication | Title of article | Study sample and method or design | Aim/objective | Results |
|---|---|---|---|---|
| Bernard and Janson, Canada, 2009 | Videoconference-based physiotherapy and tele-assessment for homebound older adults: A pilot study | 33 participants, 75 years and older | Examine the potential of a videoconference based physiotherapy intervention to improve strength and range of motion in a group of home bound older adults classified as old-old | Muscle strength increase with elderly who are hemiplegic, Parkinson and stroke. Improved range of motion. Report of an easy to use equipment. Prolong home stay. Very old people had severe functional limitation therefore was a challenge. |
| Hoenig, et al , 2006 | Development of a teletechnology protocol for in-home rehabilitation. | 13 participants, mean age of 58.2 | To describe the use of remote technology to deliver a telerehabilitation intervention to patients at home and the selection and adaptation of intervention strategies that complement the remote technology. | Education during delivering of rehabilitation taught elderly people new techniques, gain awareness of how to perform tasks. There were interaction between the client and therapist. Assessment could be done through telerehabilitation and make recommendations. |
| Peel, N. et al, Australia, 2011 | Feasibility of using an in-home video conferencing system in geriatric rehabilitation | 44 participants, mean age of 80 years | Trial of an in-home videoconferencing system to determine the feasibility of delivering rehabilitation services remotely to aged clients. | There were many drop out from the study only two participants could continue with the study.the dropout was due to hearing vision loss,dementia, short term stay in the community, less space to store the equipments, lack of staff train- |

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|---|---|---|---|---|
| | | | | ing, lack of space to conduct therapy.<br>The benefits were avoid traveling cost and time, ability to receive advice , opportunity to access services in their own comfortable familiar surrounding. |
| Taylor, DM. et al. Canada. 2012 | Remote participations' experiences with a group-based stroke self-management program using videoconference technology. | 19 participants, mean average of 66.2 | To explore the experiences of remote participants, their perception regarding factors that enable or limit videoconference participation and to obtain suggestions for enhanced group programs. | Accessibility of therapy.<br>No distance for traveling.<br>Social interaction between clients.and also with therapists.<br>Sharing information between clients.<br>Emotional connection.<br>Gain hope from one another.<br>Comparing on how they execute or how well they can do an activity than others. |
| Sveistrup, H. et al. Canada. 2003 | Experimental studies of virtual reality-delivered compare to conventional exercise program for rehabilitation. | 14 participants, | To compare between visual reality and conventional exercise. | Movements and balance improvements on both groups.<br>Positive feedback on the use of visual reality.<br>Improve confidence while walking.<br>Technology is safe.<br>It is a form of motivational exercise. |
| Holden, M. USA. 2007 | Telerehabilitation using a virtual environment improves upper extremity function in patient with stroke. | 11 participants, 56±15.6 years average | The purpose of the study was to test the feasibility of deploying system in a home-based environment and to evaluate the clinical efficacy of the virtual environment training in a group of sub- | Improvement in shoulder flexion strength and grip.<br>Less travel cost |

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|---|---|---|---|---|
| | | | jects with stroke. | |
| Glinkowski, W. Poland. 2010 | Pre-surgery and post–surgery telerehabilitation for hip and knee replacement- treatment options review and patient's attitudes towards telerehabilitation | 54 participants, average of 60.83 | Review treatment option for patients suffering hip or knee osteoarthritis and to assess patients attitudes towards telerehabilitation platform | Difficult to use computer( no skill to use it)<br>Improvement in pain and physical function.<br>Multidisciplinary rehabilitation improves outcome( function and quality of life) |
| Deutsch, J. America. 2012 | Patient-centered integrated motor imagery delivery in the home with telerehabilitation to improve walking after stroke. | 1 case study. 38 years old | To describe the implementation of an integrated motor imagery intervention including patient-centered goal, motivation aspects of imagery and delivery of therapy both on site and through telerehabilitation | Increase walking speed and distance.<br>Balance improvement<br>Comfortable and easy to use technology.<br>Preferred second therapist on site.<br>Audio lag and noise during communication.<br>No traveling time and cost needed.<br>No cost for the technology because client had own computer. |
| Tousignant, M. Canada. 2009 | In-home telerehabilitation as an alternative to face to face treatment: Feasability in post-knee arthroplasty, speech therapy and chronic obstructive pulmonary disease. | 5 community living elderly | To show three technological innovation used in in-home telerehabilitation. | There were some lost of connection but immediately robust.<br>There was improvement with all subjects in only two months after therapy in walking. |
| Finkelstein, J. 2008 | Home-based physical telerehabilitation in patients with multiple sclerosis: A pilot study | 12 participants, 18-65 years of age | To assess the feasibility and patient acceptance of home-based physical rehabilitation in patients with multiple sclerosis and to estimate the magnitude of its clinical impact. | The plan for intervention was according to patients' problem.<br>Improvement in balance, walking faster and long distance than before.<br>Education could be given about multiple sclerosis.<br>Patients had positive attitude towards the computer. |

| | | | | |
|---|---|---|---|---|
| | | | | Videoconference group had significant better health related quality of life and lower depression and fatique. Telerehabilitation provided live personal contact with socially isolated patients. |